

Meeting summary

With respect to the climate of the 21st century, it is expected that the radiative climatic impact from changes in the chemical composition of the atmosphere are likely to be dwarfed by the radiative forcing of CO₂ and aerosols. Over that time scale, the impact of climatic perturbations on OH, lightning NO_x, cloud chemical processes, and biogenic emissions are probably of secondary importance in terms of feedback onto the climate. However, this is not the case for past climates, short time scales, and regional studies. Under these conditions, perturbations on the lifetime of methane can be the critical factor for the evolution of global temperature. Over the second half of this century, the major influence of chemical composition on climate change is likely to come indirectly through effects on aerosols and vegetation.

The modeling of the feedbacks and couplings between chemistry and climate are for the most part limited. The availability of improved computer capabilities will enable us to consider relatively realistic albeit simplified coupled gas-phase chemistry and aerosols in climate models in the near future. The next step is probably the inclusion of interactive land-surface models that will influence and be influenced by tropospheric chemistry. State-of-the-art aerosol microphysics and cloud-chemistry processes will need a lot more development before they can be incorporated in climate models.

To further our understanding of the potential coupling between chemistry and climate, the workshop attendees have designed a set of model experiments (involving climate and chemistry models) to identify the importance of the nitrogen deposition on the carbon cycle over the next century. This common project is a first step towards a collaborative effort that will lead to substantial advances in the modeling and understanding of chemistry and climate as a coupled system.

The coupling of chemistry with climate will create a complex system that will most likely behave quite differently than the climate system alone. These interactions are nonlinear by nature. The intensity and relevance of these feedbacks to the problem of climate change are and will be investigated and it is the result of this investigation that will define the role of chemistry in the climate evolution.